

REMARKS

By this amendment, claims 1, 9, 10 and 12 have been amended and no claim has been cancelled or added. Accordingly, claims 1 and 4-15 are currently pending in the application, of which claims 1 and 9 are independent claims. The Office Action indicates that claims 4 and 11 are objected to but allowable if presented in independent form.

In view of the above amendments and the following Remarks, Applicants respectfully request reconsideration and timely withdrawal of the pending objections and rejections for the reasons discussed below.

Rejections Under 35 U.S.C. §103

Claims 1 and 5 stand rejected under 35 U.S.C. §103(a) as being unpatentable over U. S. Patent No. 6,323,521 issued to Seo (“Seo”) in view of U. S. Patent No. 6,291,136 issued to Masutani, *et al.* (“Masutani”). Applicants respectfully traverse this rejection for at least the following reasons.

Independent claim 1 recites:

“1. A thin film transistor liquid crystal device (TFT LCD), comprising:
...
..., wherein the drain electrode is formed of multiple layers comprising an uppermost layer formed of Cr or MoW;
...
a pixel electrode formed on said insulating layer and connected to the drain electrode through the contact hole, wherein the pixel electrode is formed of multiple layers comprising a lower layer formed of the same material as the uppermost layer of the drain electrode and an upper layer formed of metal containing Al.”

Thus, according to claim 1, (a) both the drain electrode and the pixel electrode are formed of multiple layers, and (b) the uppermost layer of the drain electrode and the lower layer of the pixel electrode are formed of the same material (Cr or MoW).

In this regard, the Examiner admitted that “Seo ... do not disclose a pixel electrode being formed of a multi-layered conductive layer comprising a lower layer formed of the same material as the upper layer of the multiple layers, and an upper layer of Al-containing metal” (Office Action, Page 2). Regarding these missing features, the Examiner asserted that Masutani discloses “a drain electrode 14 which could be comprises of Mo or W or alloy containing them or laminated film made of them ...; a pixel electrode 6 which could be comprises of Mo or W or alloy containing them or a laminated film made of them or an upper layer formed of metal Al-containing metal”.

Based on these two pieces of prior art, the Examiner asserted “it would have been obvious ... to substitute the ITO pixel electrode with MoW, since that would provide a high reliable LCD. It would have been obvious to form the MoW on the lower layer or upper layer formed of metal containing Al, since it has been held that mere reversal of the essential working part of a device involves only routine skill in the art” (Office Action, Page 3). This assertion is respectfully disagreed with.

First, according to the present invention, the uppermost layer of the drain electrode and the lower layer of the pixel electrode are *purposely* formed of the same material (Cr or MoW) *to avoid the direct contact between the MoW and Al*. As described in the background portion of the specification, if the drain electrode formed of MoW is in directed contact with a pixel electrode formed of metal containing Al, as shown in FIG. 2, a “batter effect, like inside a chemical battery, can be occurred due to difference of electro-negativity between the upper layer 212’ of

the drain electrode 21' and an Al-containing reflective layer forming the pixel electrode 27” (Specification, page 2, lines 17-19). Also, “the battery effect increases in proportion to the difference of surface area and electronegativity between two metal layers. Accordingly, the drain electrodes 21' that usually has relatively very small surface area compared to the pixel electrodes 27 enforces the battery effect more, thereby increasing the contact resistance between the pixel electrode 27 and the drain electrode 21' more” (Specification, page 3, lines 4-8)

To solve this problem, according to the claimed invention, “the lower layer of the two-layered conductive layer is preferably composed of the same material as that of the most upper layer of the drain electrodes, for example one electrode from a Cr layer and a MoW layer” (Specification, page 4, lines 12-14). Since “upper layer of the drain electrode and the lower layer of the pixel electrode are formed of the same material or metals having small differences in electro-negativity, the battery effect therebetween can be ignored” (Specification, page 5, lines 11-13).

Thus, as asserted by the Examiner, if the layer structure of the pixel electrode is reversed such that the lower layer is formed of metal containing Al and the upper layer is formed on MoW, the uppermost layer of the drain electrode formed of MoW would be in direct contact with the lower layer of the pixel electrode formed of Al. This causes the battery effects, as previously mentioned, thereby increasing the contact resistance between the pixel electrode and the drain electrode. Thus, the reversal in the pixel electrode structure does not achieve the same result, and the prevention of the battery effect is achieved only when the uppermost layer of the drain electrode and the lower layer of the pixel electrode is formed of the same material as claimed.

Thus, it is submitted that the claimed multiple layer structure of the pixel electrode is not mere obvious reversal of the conventional pixel electrode structure. Rather, as mentioned above, the claimed invention solves the problem such as the battery effect and the increased contact resistance. None of the cited references discloses or suggests the critical nature of forming the uppermost layer of a drain electrode and the lower layer of a pixel electrode with the same material such as Cr or MoW. Rather, in Masutani, Al and MoW are used in a non-discriminatory basis for the pixel electrode which is in direct contact with a pixel electrode. Thus, it is respectfully submitted that claim 1 is patentable over the cited references.

Accordingly, Applicants respectfully request withdrawal of the 35 U.S.C. §103(a) rejection of claims 1 and 5.

Claims 9, 10 and 12 stand rejected under 35 U.S.C. §103(a) as being unpatentable over Seo in view of Masutani. Applicants respectfully traverse this rejection for at least the following reasons.

Independent claim 9 recites “pixel electrode is *multi-layered* and comprises a lower layer formed of the same material as the drain electrode”. As previously mentioned, none of the cited reference discloses or suggest this claimed feature. Thus, it is submitted that claim 9 is patentable over Seo in view of Masutani. Claims 10 and 12 that are dependent from claim 9 would be also patentable at least for the same reason.

Accordingly, Applicants respectfully request withdrawal of the 35 U.S.C. §103(a) rejection of claims 9, 10 and 12.

Claims 6, 7, 13 and 14 stand rejected under 35 U.S.C. §103(a) as being unpatentable over Seo in view of Masutani, and further in view of U. S. Patent No. 5,917,563 to Matsushima ("Matsushima"). Applicants respectfully traverse this rejection for at least the following reasons.

Claims 6, 7, 13 and 14 are dependent from independent claims 1 and 9. As previously mentioned, claims 1 and 9 are believed to be patentable over Seo and Masutani. Particularly, none of these references discloses or suggests the pixel electrode being *multi-layered* and comprises a lower layer formed of the same material as the drain electrode.

Matsushima discloses the second inter-layer insulating film 24 being photosensitive but does not disclose or suggest the picture element electrode 25 being multi-layered and comprising comprises a lower layer formed of the same material as the drain electrode. Thus, Matsushima fails to cure the deficiency from the teachings of Seo and Masutani. Therefore, independent claims 1 and 9 are still patentable over Seo, Masutani and Matsushima. Hence, claims 6, 7, 13 and 14 that are dependent from claims 1 and 9 would be also patentable at least for the same reason.

Accordingly, Applicants respectfully request withdrawal of the 35 U.S.C. §103(a) rejection of claims 6, 7, 13 and 14.

Claims 8 and 15 stand rejected under 35 U.S.C. §103(a) as being unpatentable over Seo in view of Masutani, and further in view of U. S. Patent No. 6,358,759 to Hirabayashi ("Hirabayashi"). Applicants respectfully traverse this rejection for at least the following reasons.

Claims 8 and 15 are dependent from independent claims 1 and 9. As previously mentioned, claims 1 and 9 are believed to be patentable over Seo and Masutani. Particularly,

none of these references discloses or suggests the pixel electrode being *multi-layered* and comprises a lower layer formed of the same material as the drain electrode.

Hirabayashi discloses microlenses arranged on the counter substrate 20. However, Hirabayashi does not disclose or suggest the picture element electrode 25 being multi-layered and comprising comprises a lower layer formed of the same material as the drain electrode. Thus, Hirabayashi fails to cure the deficiency from the teachings of Seo and Masutani. Therefore, independent claims 1 and 9 are still patentable over Seo, Masutani and Hirabayashi. Hence, claims 8 and 15 that are dependent from claims 1 and 9 would be also patentable at least for the same reason.

Accordingly, Applicants respectfully request withdrawal of the 35 U.S.C. §103(a) rejection of claims 8 and 15.

Other Matters

In this response, claims 1, 9, 10 and 12 have been amended for the purposes of better wording, informality correction and clarification. No amendment has been made to narrow the claim scope to avoid any of the cited references since all the claims are believed to be patentable over the cited references.

CONCLUSION

Applicants believe that a full and complete response has been made to the pending Office Action and respectfully submit that all of the stated objections and grounds for rejection have been overcome or rendered moot. Accordingly, Applicants respectfully submit that all pending claims are allowable and that the application is in condition for allowance.

Should the Examiner feel that there are any issues outstanding after consideration of this response, the Examiner is invited to contact the Applicant's undersigned representative at the number below to expedite prosecution.

Prompt and favorable consideration of this Reply is respectfully requested.

Respectfully submitted,


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